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# THE RESEARCH FACILITIES ABOARD A.C.S. ST. MARGARETS

[U]

BY  
N. H. FIELD

## CONDITIONS OF RELEASE

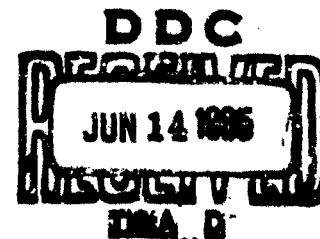
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**A.C.S. ST. MARGARETS** [u] (8)

by

N.H. Field ,

ABSTRACT

This note lists with photographs the facilities aboard A.C.S. ST. MARGARETS, now converted to a general purpose research ship. Some examples of the work already completed, and possible future work, are discussed. Mention is also made of the facilities available on A.C.S. BULLFINCH.

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### INTRODUCTION

A.C.S. ST. MARGARETS was built by Swan Hunter of Newcastle-upon-Tyne in 1944 as a conventional cable repair ship. In this role, much good work was done and during the period 1952-1960 many small bottom-laid units were put down. In 1960 it became clear that a "general purpose" Research and Cable Ship with heavy lift and additional laboratory facilities was needed, to lay units weighing about 12 tons, and to assist in the military acoustic and oceanographic programmes.

In 1961 ST. MARGARETS was taken in hand by H.M. Dockyard, Devonport for this conversion. The purpose of this note is to list the facilities at present offered aboard A.C.S. ST. MARGARETS. Some mention will be made also of the facilities aboard A.C.S. BULLFINCH, which has undergone a rather different conversion.

### 2. SPECIFICATION & ADMINISTRATION OF A.C.S. ST. MARGARETS

Length overall	263' 4"
Breadth	36' 3"
Gross Tonnage	1549.20 tons
Net Tonnage	589.72 tons
Loaded draft	16.6 ft.
Speed	10½ knots
Endurance	3,360 miles at 10 knots
Cable Coiling Capacity	7,000 cu.ft. or 370 tons
Complement	11 Officers, 8 Scientific Officers, 57 Ratings

The main propulsion is twin screw, triple expansion steam reciprocating engines, with a maximum seagoing Horse Power of 1266. Steam is supplied by two Babcock and Wilcox water tube boilers of the sinuous header type. The fuel capacity is 260 tons, and the fresh water capacity 128 tons. The evaporator is capable of making 18 tons of fresh water each day.

This apparently large crew is carried, to provide a large fore-deck crew during cable and unit laying operations. In contrast to other research ships, (e.g. R.R.S. DISCOVERY, U.S.S. CHAIN), ST. MARGARETS fore-deck crew perform all the "over-the-side" work during scientific data-collecting cruises, thus permitting the collection of the data by a much smaller scientific team.

The Cable Ship Service, operated by Director General of Weapons, Underwater, (Naval) Bath, through the Superintendent, Admiralty Cable Ships, is a small "Civil-Service" manned organisation. This method of manning has built up a team of Ship's Officers and Key Ratings with a vast experience of this type of work. (Contrast the American treatment of their Cable Ship Service as a normal unit of the Navy).

The ships are administered by S.A.C.S. under Commander-in-Chief, Plymouth and are maintained by H.M. Dockyard, Devonport.

The programme of ship's operations are co-ordinated by D.G.W.U.(N) in consultation with the various user departments.

3. EQUIPMENT AND FACILITIES ABOARD A.C.S. ST. MARGARETS

a) Cable Machinery

Three 6 feet Bow Sheaves are fitted, and tested to operate at 25 tons. They can be clearly seen in figure 32.

Cable tension is measured by means of load-cell dynamometers, calibrated to read to 30 tons, with repeaters on the upper bridge, navigation bridge, fore-deck and bows. The sheaves and load cells can be seen in figure 1.

The main cable machinery consists of two 6 feet diameter open sided drums, coupled to two Johnson & Phillips steam engines. These engines may be coupled to the drums in the following fashion.

1 engine to each drum, high gear,  $7\frac{1}{2}$  tons/(maximum pick up speed 250 ft./min at 5 tons)

1 engine to each drum, low gear, 15 tons/(maximum pick up speed 100 ft./min. at 15 tons)

2 engines to one drum, low gear, 30 tons/(maximum pick up speed 100 ft./min. at 30 tons)

These drums are fitted with fleeting knives, Heenan and Froude Water Brakes, and water cooled wood block band brakes.

The cable machinery can be seen in figures 2, 3, 32, 34.

Two cable tanks 24 feet and 23 feet in diameter, with fitted crinolines, and divided into inner and outer coiling spaces have a total capacity of 7000 cu. ft. or 370 tons. The interior of No. 2 Cable Tank can be seen in figure 4.

Many ring bolts are fitted in strategic positions on the deck to permit the "stoppering-off" of cable, and each tested to 25 tons.

When so desired it is possible to utilise the cable machinery, and 6 x 3 cable rope (breaking strain 18 tons) in conjunction with scrap underwater cable to anchor the ship in depths of up to 3000 fathoms in winds of up to Force 5. This "sea-anchor" can be transferred aft, to anchor the ship by the stern and provide a clear fore-deck. A sail may also be fitted to the main derrick to keep the ship stern to wind.



(b) Lifting facilities

A single foremast on the centre line of the ship, carries two derricks. The larger port-side derrick has a capacity of  $13\frac{1}{2}$  tons, and may be used on either side of the ship, but not abaft the beam. The smaller derrick on the starboard side has been lengthened to 36 ft. and down-graded to  $2\frac{1}{2}$  tons. This derrick will plumb the fore-hold, and is used for loading, and buoy-work see figure 1.

The main derrick is powered by two 5 ton steam winches, (one to control the fourfold purchase, and one the fourfold topping lift) see figure 5. The smaller derrick is normally served by the Emerson Walker Capstan, which has a maximum working load of  $3\frac{1}{2}$  tons.

A shorter derrick with a capacity of 3 tons is stored at Turnchapel.

The anchor winches are provided with wind-lass barrels, which may be used to work guy-ropes etc.

Aft of the bridge on the port side has been fitted an Oceanographic Winch and Kemp Davit. This winch may be used for Bathy-Dips and Bottle samples, and has a capacity of 4000 metres of 4 mm wire. This winch is also steam driven. Whilst this site is far from ideal, it enables the winch to be fitted without "cluttering-up" the fore-deck. This winch may be seen in figure 6.

At the stern is fitted a 10 ton steam winch to operate the stern anchor, and drum ends are also fitted to provide power for the boat davits, and for use as a stern capstan during mooring. The winch drum carries 300 fathoms of 4" wire. The stern anchor is carried stowed on a cradle and weighs  $2\frac{1}{2}$  tons. This installation may be seen in figures 7 and 8.

On the starboard side, at bridge level is fitted a Kelvin Electric sounding machine and boom, which may be used with "snappers" to obtain bottom samples in shallow water. 300 fathoms of wire are fitted.

Davits with a lifting capacity of 5 cwt. are located on the port and starboard sides, just forward of the bridge structure, approximately 20 feet from the stern on the port side, and at the stern.

c) Laboratory Facilities

(i) Main Laboratory

No. 3 cable tank has been converted into a battery room, and main electronic laboratory. This laboratory is fitted with 10 six-foot standard 19" Cabinet racks. One bench with cupboards, one work bench, and a desk. Access is provided by a central ladder from main deck level. The ladder may be removed and heavy equipment lowered from the deck laboratory, provided it does not exceed 5'6" in height and 3 feet in diameter.

This laboratory is lit by fluorescent fittings supplied by the ships D.C. mains, and is supplied with 50 c/s 230 volts A.C. 440 volts 50 c/s 3 phase A.C. 250 volts D.C. from the low power battery, 6 volts D.C. from 3 LL Batteries and 220 or 110 volts D.C. from the main battery. These facilities may be seen in figures 9, 10, 11.

(ii) Deck Laboratory

This laboratory is situated at the after end of the shelter deck, and is fitted with one bench, one desk, and one safe. The deck laboratory is extremely useful when only a small amount of equipment is carried, or it may be used as an analysis room, during trials.

This laboratory is supplied with 220 volts D.C. and 230 volts 50 c/s A.C. and may be seen in figure 12.

(iii) Wet Laboratory & Dark Room

This is the latest facility added to ST. MARGARETS, and is on the port side adjacent to the oceanographic winch. It is fitted with a rack, drain tray for water bottles, and a large sink. The port is fitted with a "dead-light" and curtains are available to cover the door. Photographic safelights are fitted, and the room may be used for the processing of film at sea. No photographic equipment is at present installed. The wet laboratory is supplied with 220 volts D.C. and may be seen in figure 13.

(iv) Amplifier Space

The after end of the main hold has been converted into a laboratory space, and is intended eventually to house a high power amplifier for acoustic research purposes. At present no amplifier is fitted, and the space is used as a ship's store.

The amplifier space is fed with 230 volts 50 c/s A.C. 440 volts 3 phase 50 c/s A.C. and 220 and 110 volts D.C. from the main battery.

(v) Inter-connecting cables

The fore-deck, deck laboratory, main laboratory, after deck, lower bridge and cable tanks are connected by junction boxes and screened cables. Cable trunking is provided between the cable tanks and the main laboratory, and between the main and deck laboratories.

(vi) Cable test gear

Conventional test gear to enable D.C. measurements to be made on good and defective cables is installed on the port side of the lower bridge. See figure 18.

d) Power Supplies

The ships supply of electric power is normally obtained at sea from 220 volt D.C. steam powered generators, one 50 Kw and one 40 Kw. Emergency power is supplied by one 30 Kw 220 volt D.C. diesel generator.

Rotary D.C. - A.C. converters are fitted to provide 50 c/s for the various navigational and communication equipment.

The laboratories are supplied by two 10 Kw 230 volts 50 c/s alternators, and one 3 phase 230 volts 2.5 Kw 50 c/s A.C. machine. A transformer is fitted in the laboratory to supply 440 volts 3 phase. These machines are shown in figure 14.

One of the communications sets (ARC 52 described later) needs 400 c/s 200 volts 3 phase A.C., which is supplied by the 1 Kw machine sited in the cable flat. This machine along with one of the "ships" 50 c/s alternators may be seen in figure 15.

The battery room shown in figure 16 contains 3 lead/acid batteries. One battery of 3 LL cells provides 6 volts D.C. for the main laboratory, the second battery of 125 S.A.T.C. cells provides 250 volts D.C. for the main laboratory. The main battery consists of 110 LL cells tapped at the mid pt. This battery may be used to power essential ship's services, and the laboratory generators. In this latter condition it is possible to operate the ship in "silent-ship" condition for 6 hours. A battery charging room is fitted, and the battery may be re-charged from ship's mains in 10 hours.

e) Navigational Equipment

ST. MARGARETS is fitted with a comprehensive range of navigational equipment.

The gyro-compass shown in figure 17 is fitted with three repeaters on the upper bridge, two repeaters on the lower bridge, a steering repeater, and one repeater at the bows for use by the Chief Officer during cable work. Repeaters are also fitted to the radar, H.F./D.F. set, in the chart room, and the after steering position.

Decoa Radar Type 974 fitted with gyro-stabilized display is fitted in the Chart Room and one the upper bridge, see figures 21 and 22.

Q.M.10 Decoa Navigator equipment is fitted. The receiver is in the Chart Room, and the decometers are mounted on the chart table on the starboard side of the bridge. For special trials Decoa Track Plotter equipment is hired. See figures 19 - 10.

Two echo sounders are fitted, Type 765 for shallow water use and Type 773 for deep water. The Type 773 is fitted 'for but not with' precision depth-recorder equipment, see figure 20.

P.M.12 M.F./D.F. is fitted in the chart room along with Loran DAS2 see figures 20 and 21.

Chernikeef and Walker logs are fitted, see figure 19.

On the upper bridge are installed two 9' base rangefinders, see figure 22 and 2 one meter and one  $\frac{1}{2}$  metre portable rangefinders are available.

f) Communications Equipment

ST. MARGARETS is fitted with the normal communications equipment required by the Ministry of Transport for her class, and in addition is fitted with some naval equipment, see figure 23.

(i) Commercial Equipment

Main Transmitter Marconi Oceanspan modified for R/T and fitted with a variable frequency oscillator unit.

Main Receiver Marconi Atalanta

Auto Alarm Marconi Alert 500 KCS Guard Receiver, Marconi Autokey, automatic keying device, and Marconi Vigilant Auto alarm units are fitted.

Sound Reproduction Equipment Marconi Dynatron equipment is installed to provide domestic radio facilities in all the messes.

All this equipment is hired from Marconi International Marine Co.

(ii) Naval Equipment

M.F./H.F. Transmitter Type 618 Transmitter with C.A.S. receiver, and remote control located on the bridge is fitted.

U.H.F. Transceiver Type 691 U.H.F. equipment is fitted with remote-control positions located on the bridge and in the deck laboratory.

V.H.F. Transceiver Type 689 V.H.F. equipment is fitted with remote control on the bridge. This equipment may be fitted with a second remote-control unit, but this is not yet supplied.

U.H.F. Homing A.R.C.52 U.H.F. transceiver fitted with "Violet Picture" homing equipment has been installed, on the lower bridge and beacon transmitters operating on 245.1 Mc/s are available. This equipment is to be fitted with an additional aerial to provide an additional U.H.F. Channel, see figures 20 and 24.

Walkie-Talkie Transceivers Two Type 615 transceivers are carried for communication with the boat or shore during cable laying operations.

(iii) Internal Communications

Loudspeaker inter-com facilities are provided between the upper bridge, lower bridge, radio office, chart-room, fore-deck, bows, after deck, main laboratory, deck laboratory, and telephone facilities are provided between the lower bridge, deck laboratory, main laboratory, amplifier room, engine room, gyro room, after deck.

g) Boats and life-rafts

ST. MARGARETS carries one 25 ft. and one 23 ft. motor boats and one 32 ft. cable cutter fitted with sheave and davit, capable of carrying 3 tons of cable. These boats are used as "work-boats" with the motor boats towing the cable cutter during shore-and lays.

Life-saving equipment consists of eight 20 man life-rafts carried 4 on each side of the ship, two on the lower bridge, and two on the after deck. The boats may be seen in figures 25, 26 and 27.

h) Accommodation

The officers cabin accommodation has remained substantially unaltered by the conversion. Additional cabins, some single berth, and some twin berth, see figures 28 and 29, have been provided for eight scientific staff. The ward-room has been enlarged to provide additional "day-time" space. See figure 30. An additional block of cabins has been installed on the gun platform and is used by the senior ratings, see figure 27. The petty officers accommodation has been resited and most cabins are twin berth. The sea-men and stokers continue to be accommodated on mess-decks aft.

j) Workshop facilities

The ships workshop is fitted with a lathe, vertical drill and a shaper. This equipment although fitted as an engineers repair workshop, has permitted trials equipment to be repaired or modified. See figure 31.

4. SOME OF THE WORK ACCOMPLISHED BY A.C.S. ST. MARGARETS

These photographs show some of the work which has been done by ST. MARGARETS since the conversion in 1962.

Figure 32, shows Tripod Type 10 loaded on the fore-deck. This tripod was 22' high, had a leg-spread of 26' and weighed 12½ tons.

Figure 33, shows Type 10 lifted over the side, preparatory to passing to the bows. Several of these units, performing various functions, have been laid.

Figure 34, shows Type 21 loaded on the fore-deck and figure 35 shows Type 21 lifted out. Type 21 was 60' long, 10' high and weighed  $6\frac{1}{2}$  tons.

Figure 36, shows a target 19' along each side, and weighing  $3\frac{1}{2}$  tons in air. This was suspended from the bows and from a No. 2 buoy.

Figure 37 shows two tripods which were laid by ST. MARGARETS.

Figure 38 shows a transducer test rig weighing about  $\frac{1}{2}$  ton and 12' overall, which was lowered to 1000'.

Figure 39, shows a towed transducer about to be streamed from the stern davit.

Figure 40 shows two towed bodies ready for streaming.

Figure 41 shows a towed body being lowered from the starboard davit.

It is considered that ST. MARGARETS for some future trials might carry, lower, and possibly lay a beam 135' long and weighing about 6 - 8 tons.

#### 5. A.C.S. BULLFINCH

Whilst this note is primarily devoted to ST. MARGARETS, it is thought that some reference to BULLFINCH and her facilities should be made.

At present BULLFINCH carries the same cable facilities, but with the addition of the third cable tank. BULLFINCH is fitted with two 3 ton derricks, but is not fitted with winches or stern anchor, the power for the derricks being supplied by the capstan.

BULLFINCH is fitted with an electronics laboratory aft of the Captains Cabin, and is fitted with oceanographic winch and wet laboratory.

A main battery and resiliently mounted diesel generator are fitted for silent ship operation.

With the exception of the A.R.C.52 U.H.F. set, the communication facilities are identical, and Type 978 Radar is fitted in lieu of Type 974.

#### 6. BALLASTING

To compensate for this additional "top-weight" on both ships, many tons of permanent ballast are now installed, (in fact ST. MARGARETS carries 268 tons) and certain limitations have been placed on the use of the fuel and water tanks.

#### 7. ACKNOWLEDGEMENTS

Thanks are due to Captain W.H.W. Mathews O.B.E., R.D., Superintendent Admiralty Cable Ships for permission to reproduce the information contained in his article in Journal of the Royal Naval Scientific Service

November, 1963.

Thanks are due to the Captain and Officers of A.C.S. ST. MARGARETS and BULLFINCH for this unstinted co-operation during many trials over the past years.

Thanks are due also to the many photographers from many Admiralty Departments who have assisted in the collection of the photographs reproduced in this note.

N.H. Field (EO)

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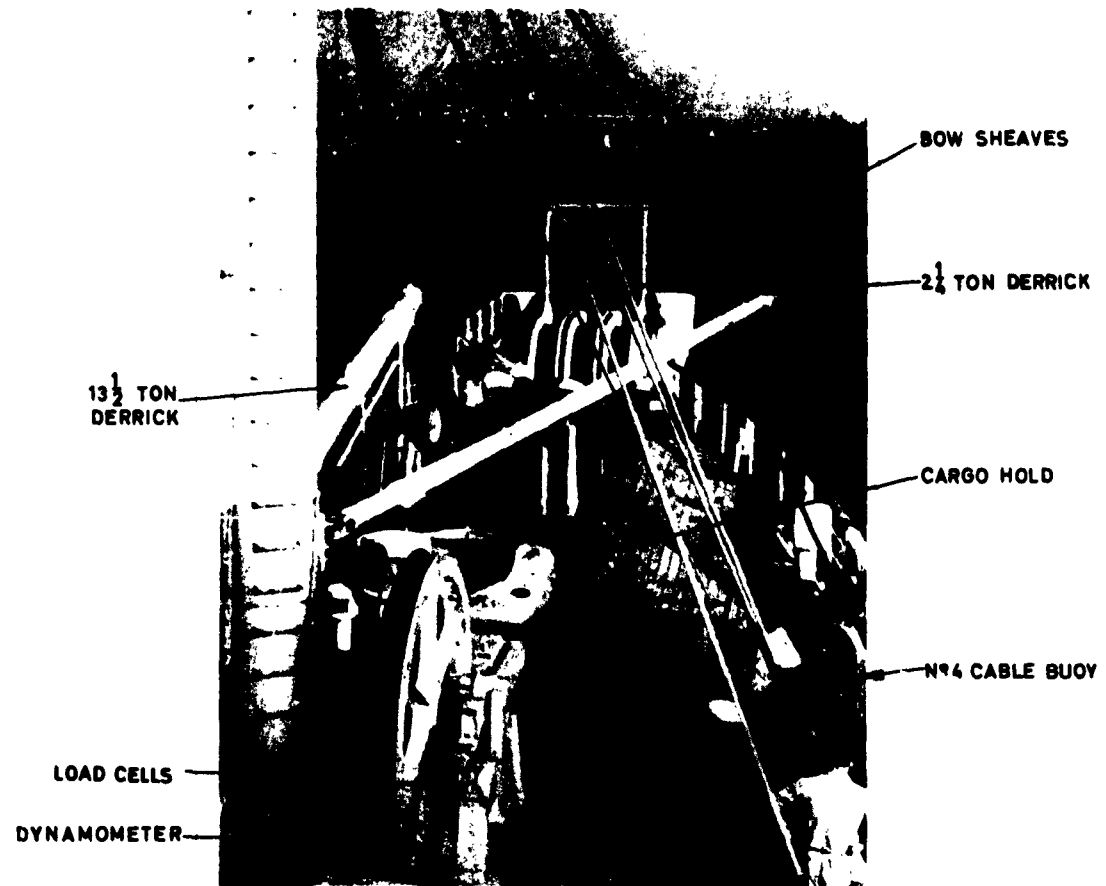


FIG.1 FOREDECK OF A.C.S. St. MARGARETS

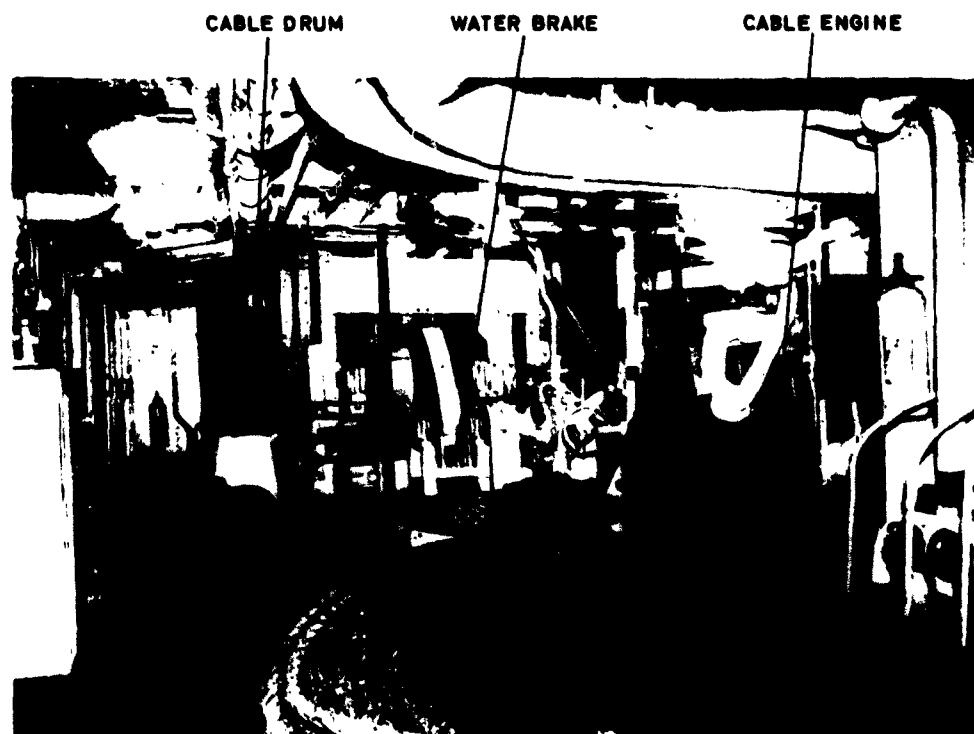


FIG.2 CABLE MACHINERY



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FIG. 4 NO 2 CABLE TANK WITH SCRAP CABLE



FIG. 3 CABLE ENGINE

FLEETING KNIFE

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FIG. 5 5 TON WINCH

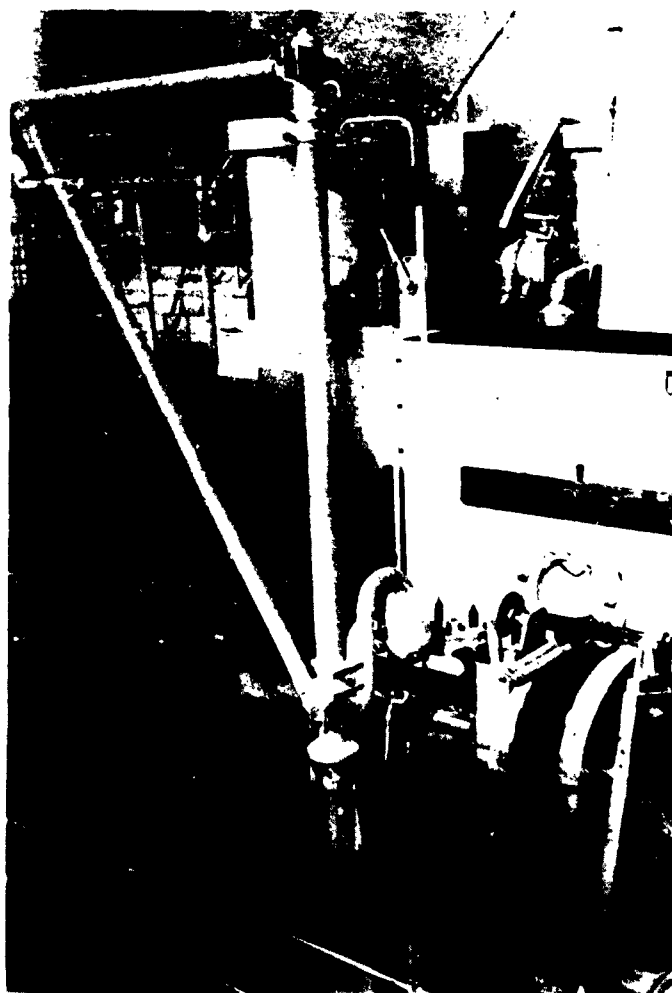


FIG. 6 OCEANOGRAPHIC WINCH AND KEMP DAVIT

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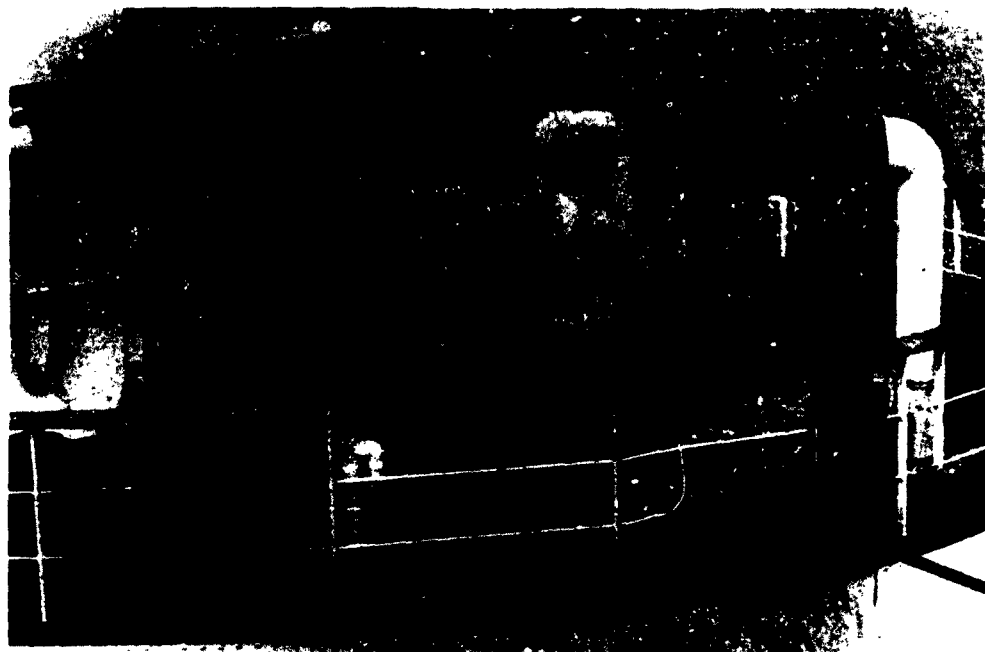


FIG. 7 STERN ANCHOR WINCH



FIG. 8 STERN ANCHOR

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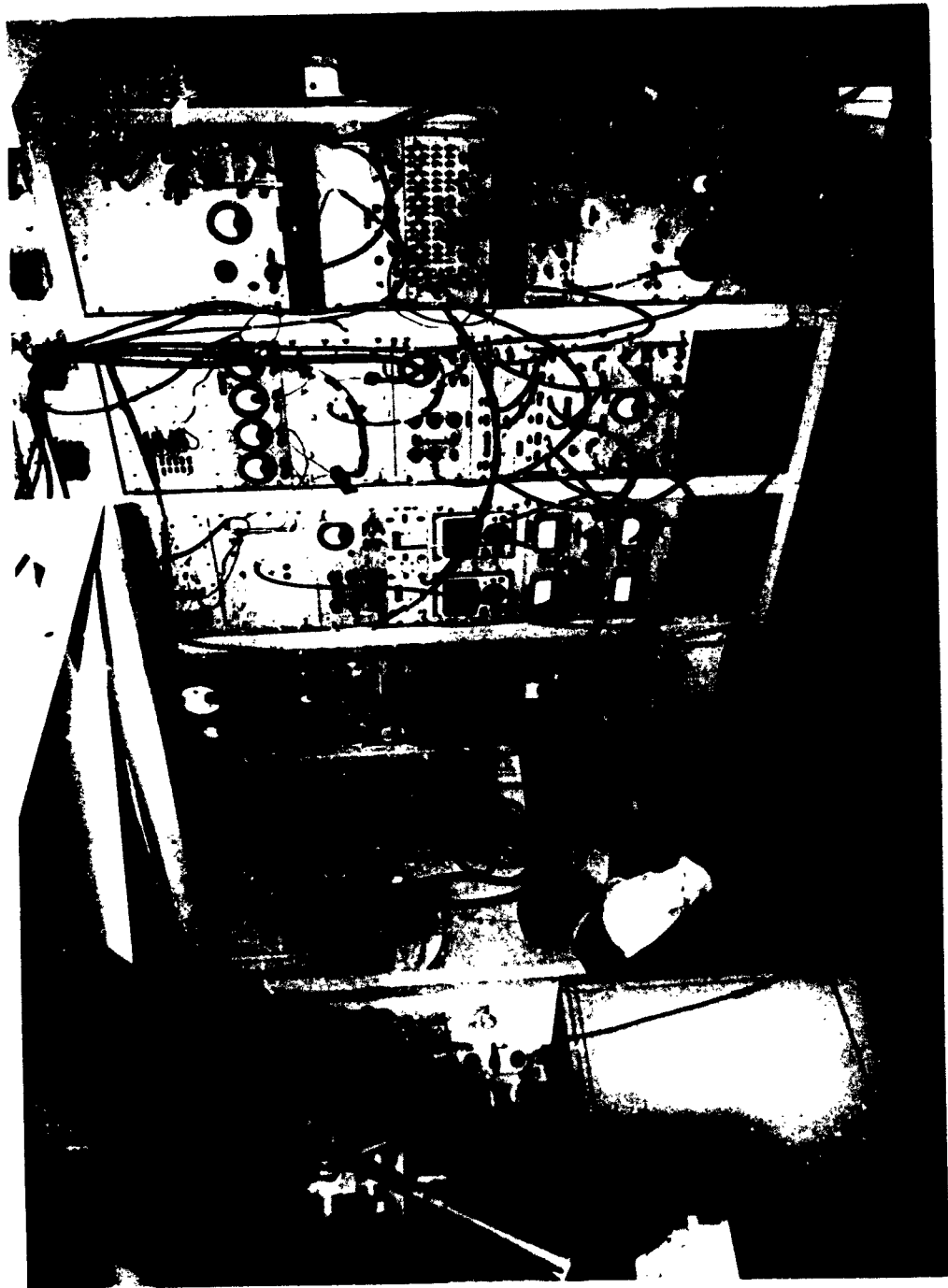


FIG. 9 MAIN LABORATORY

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FIG. 10 MAIN LABORATORY

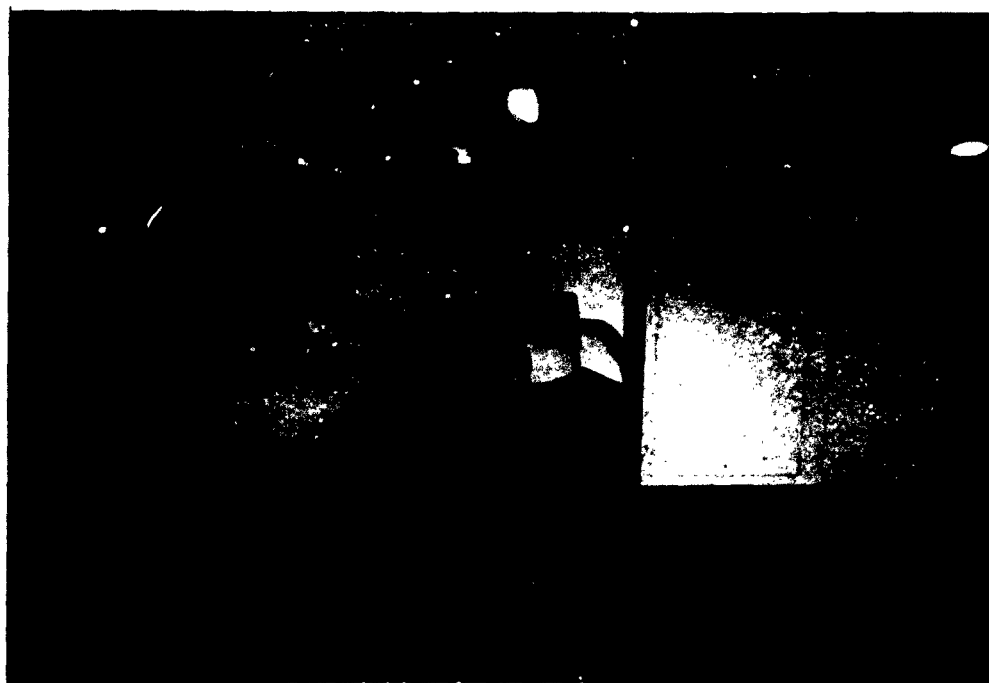


FIG. 11 MAIN LABORATORY

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FIG.12 DECK LABORATORY

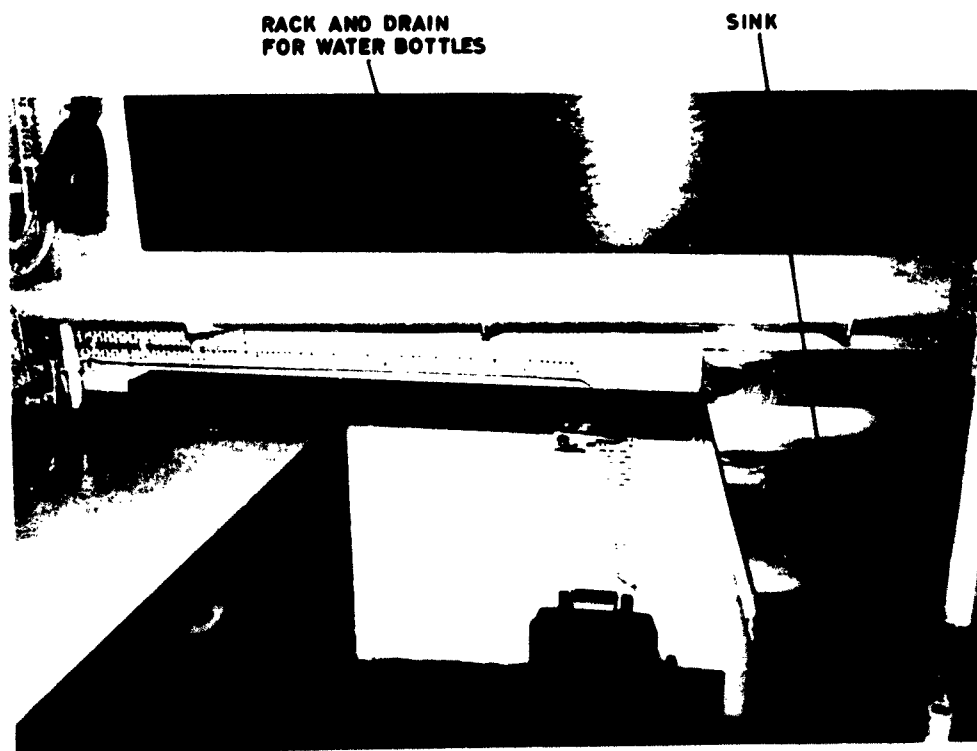


FIG.13 WET LABORATORY

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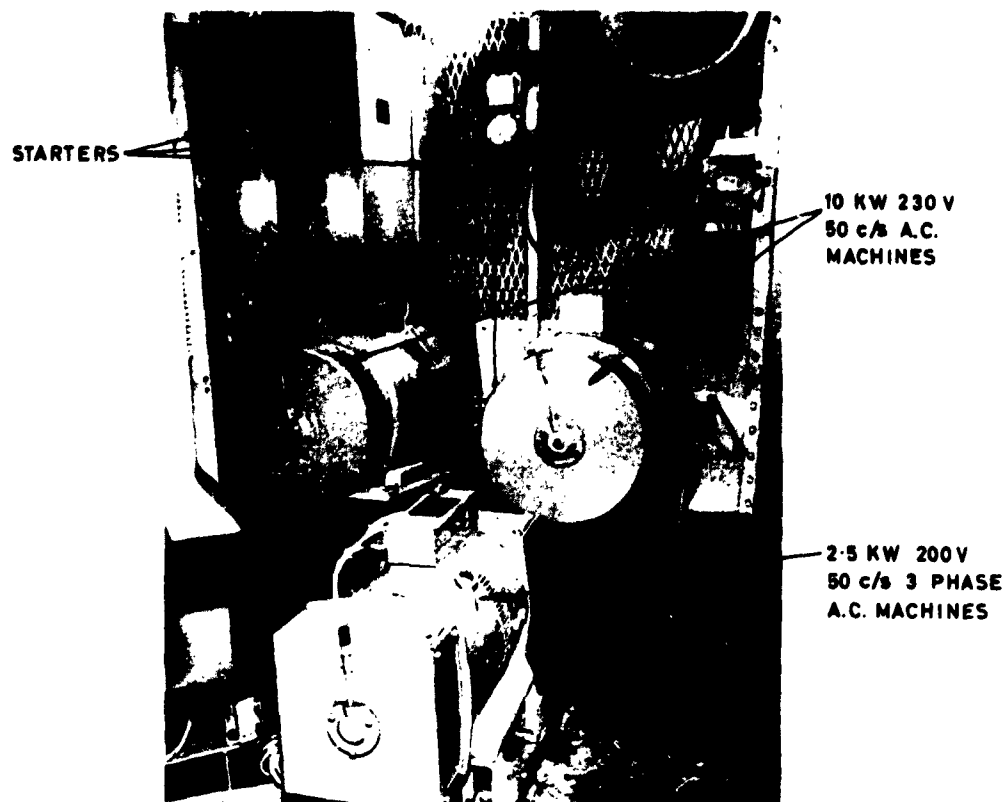


FIG. 14 D.C.-A.C. CONVERTORS

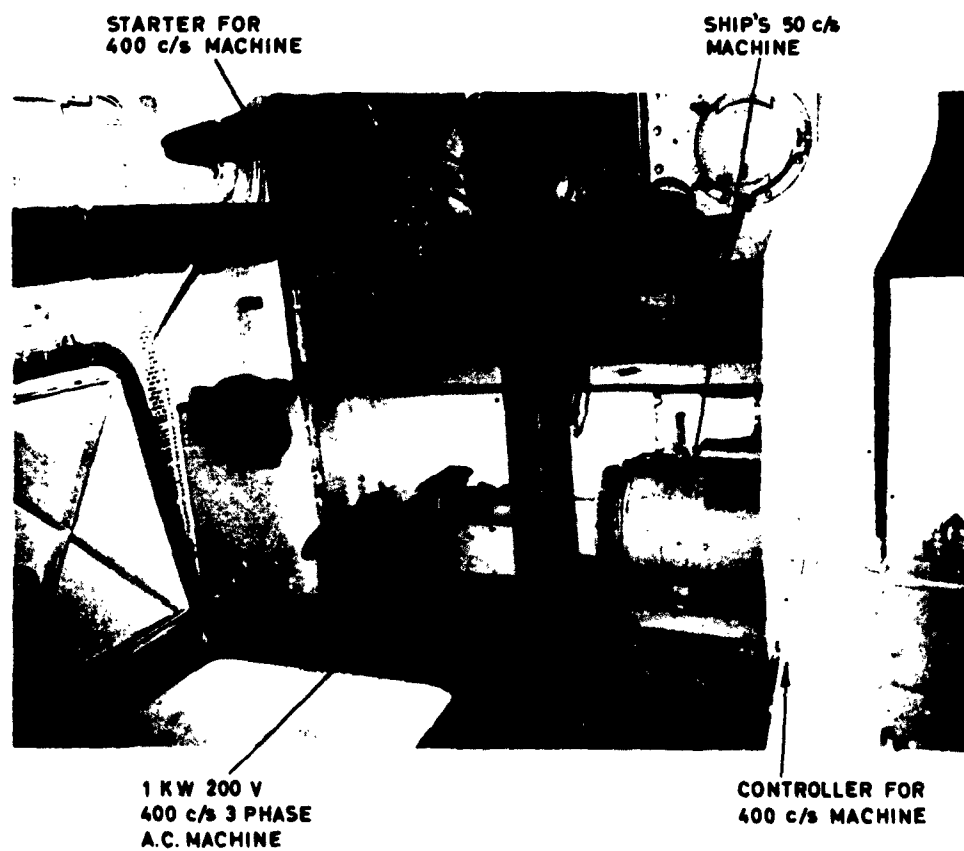


FIG.15 400 c/s A.C. ALTERNATOR

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250 VOLT  
BATTERY  
STATIC CELLS

MAIN BATTERY  
LL CELLS

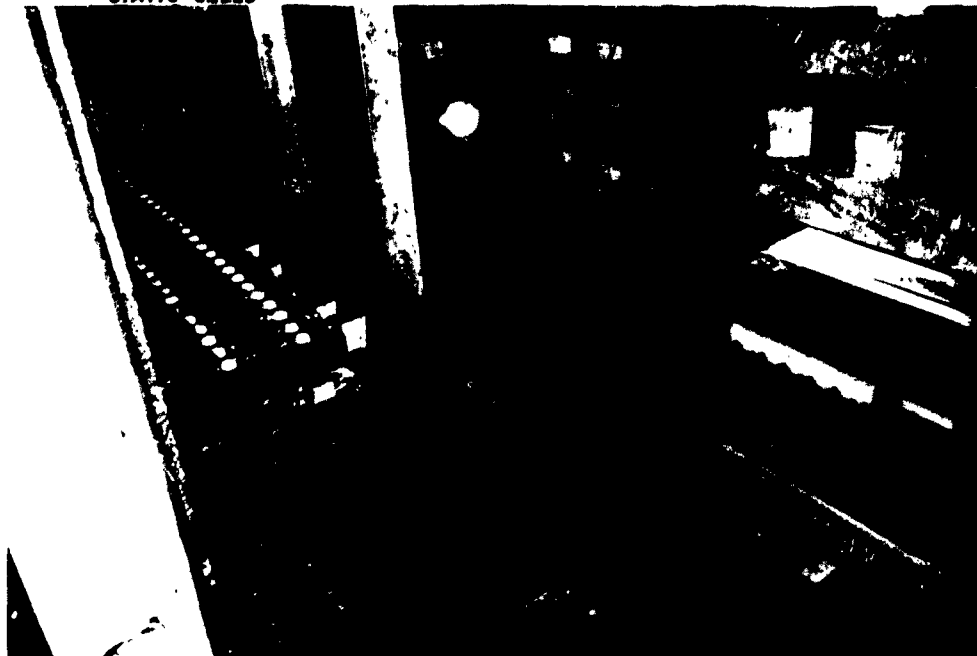


FIG. 16 BATTERY ROOM



FIG. 17 GYRO ROOM



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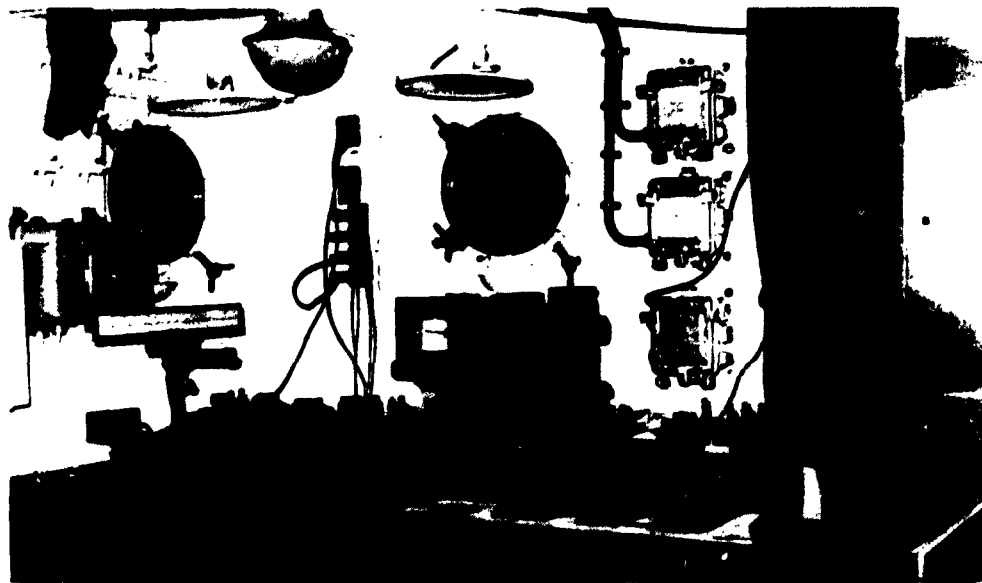


FIG. 18 CABLE TEST GEAR MOUNTED ON LOWER BRIDGE

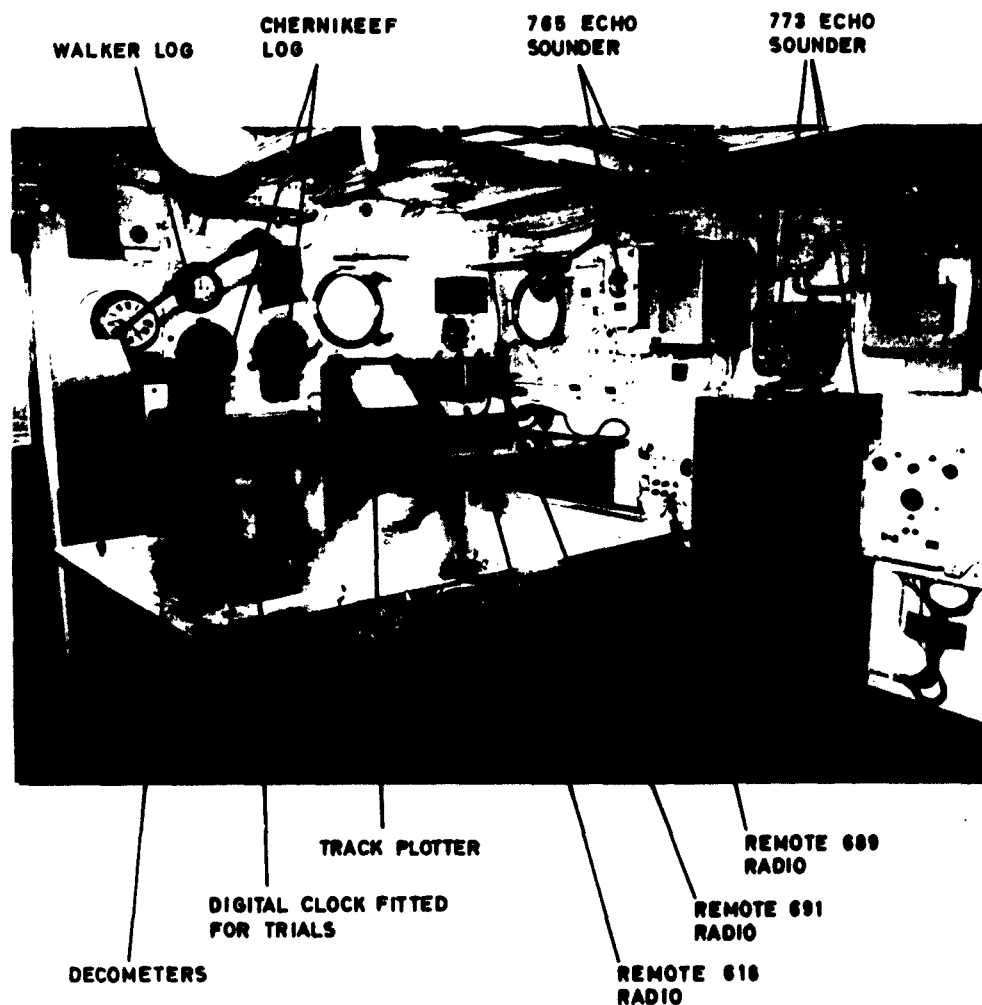


FIG. 19 NAVIGATIONAL EQUIPMENT ON LOWER BRIDGE

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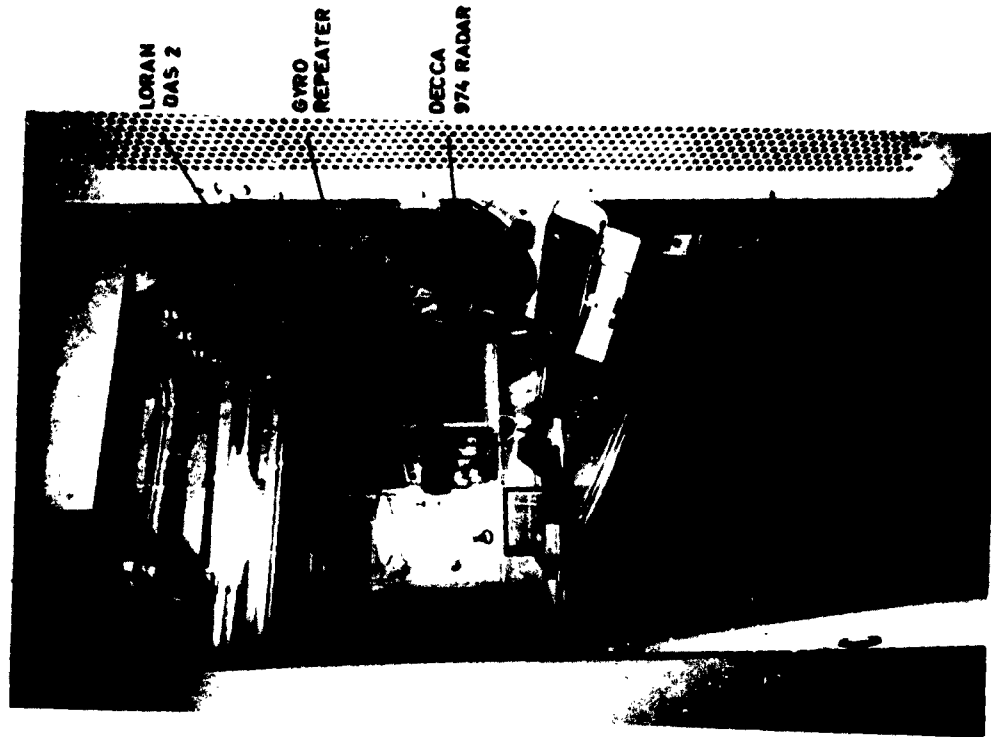


FIG. 21 CHART ROOM

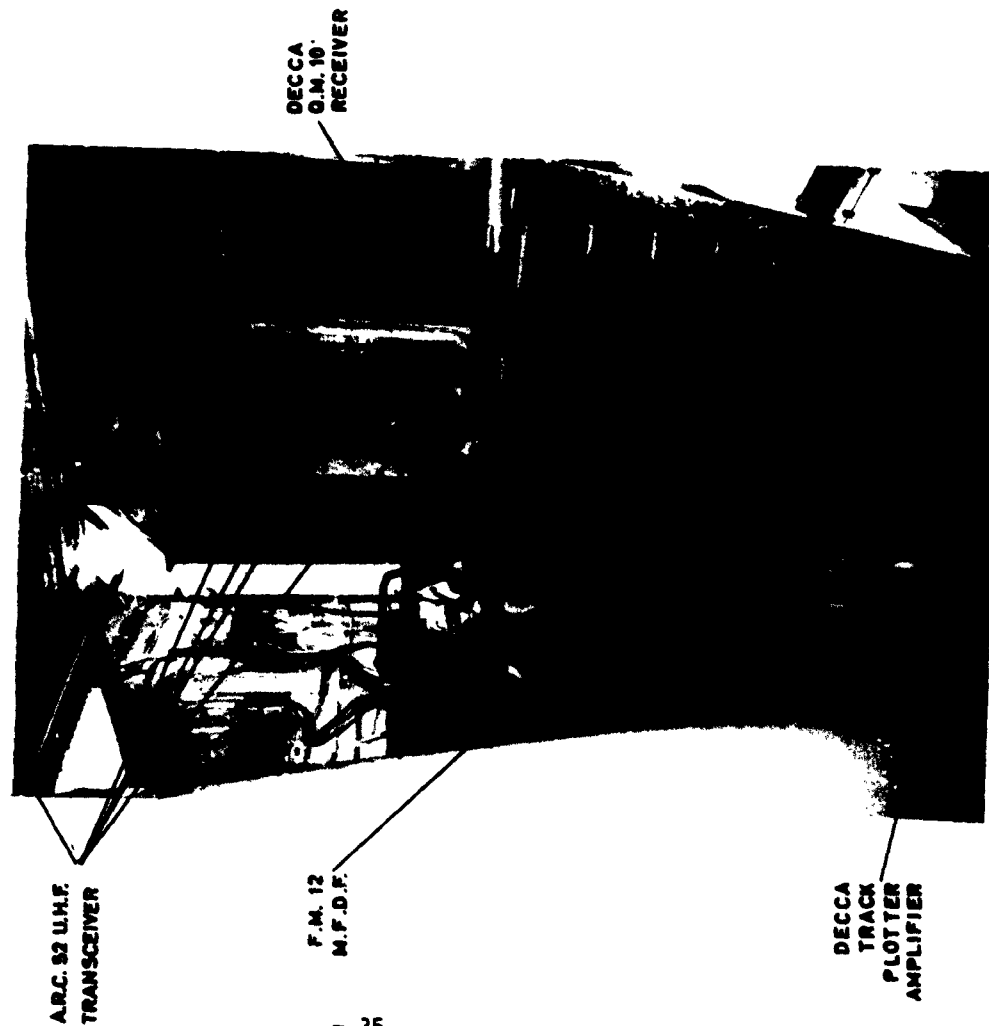


FIG. 20 CHART ROOM

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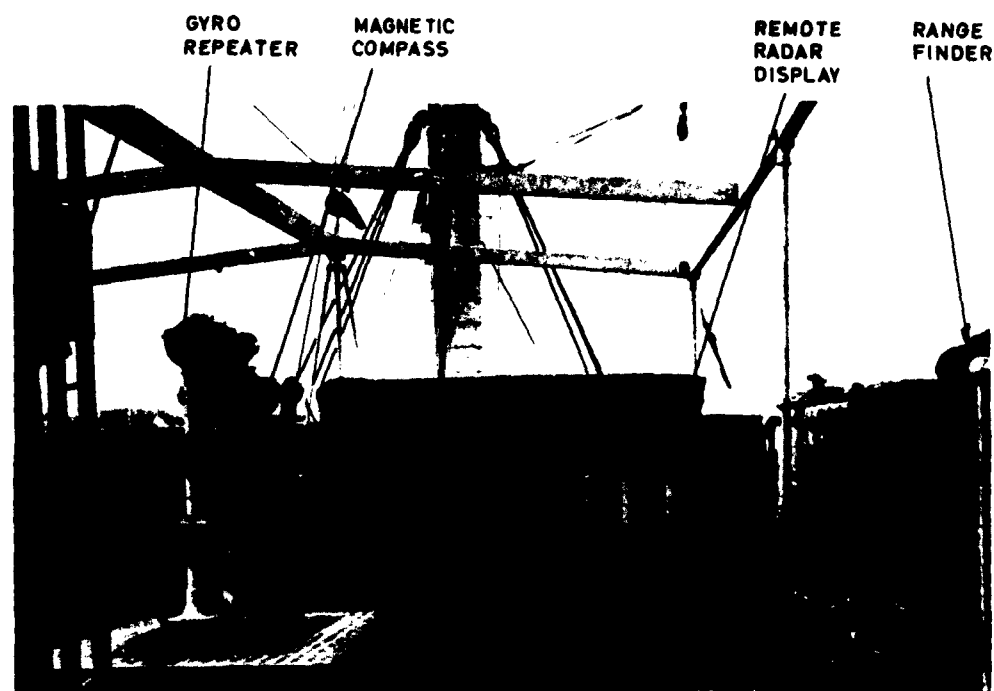


FIG 22 UPPER BRIDGE

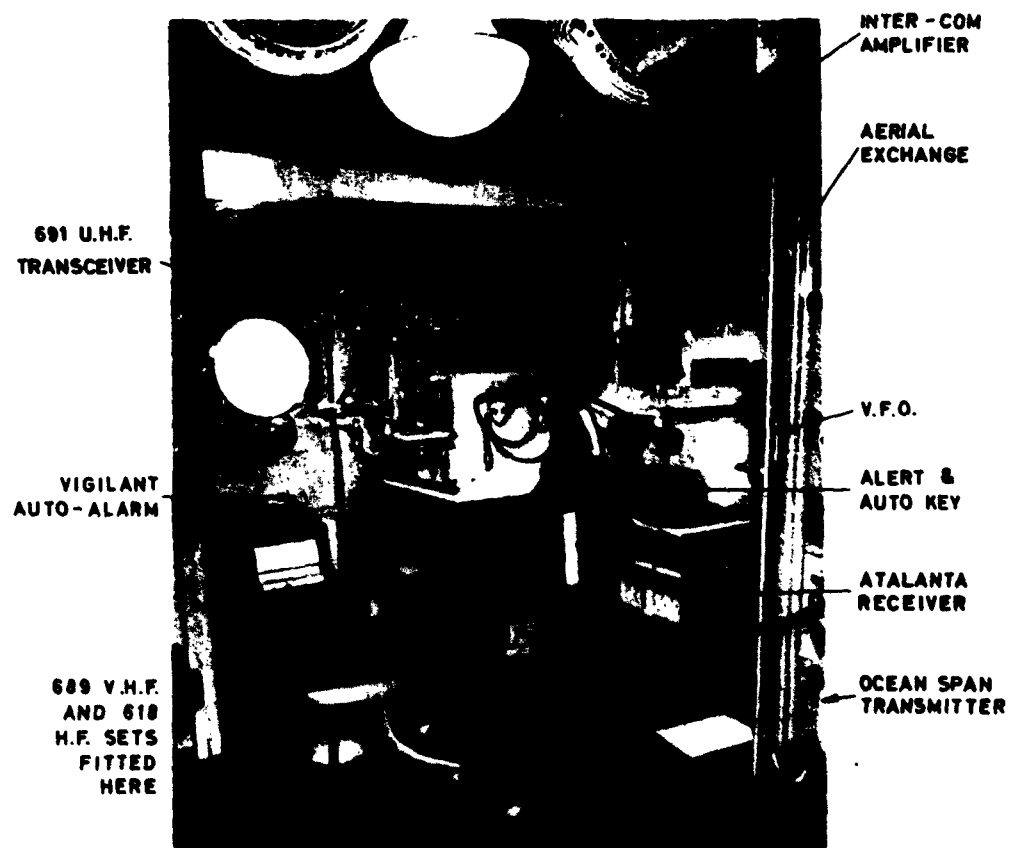


FIG 23 RADIO OFFICE

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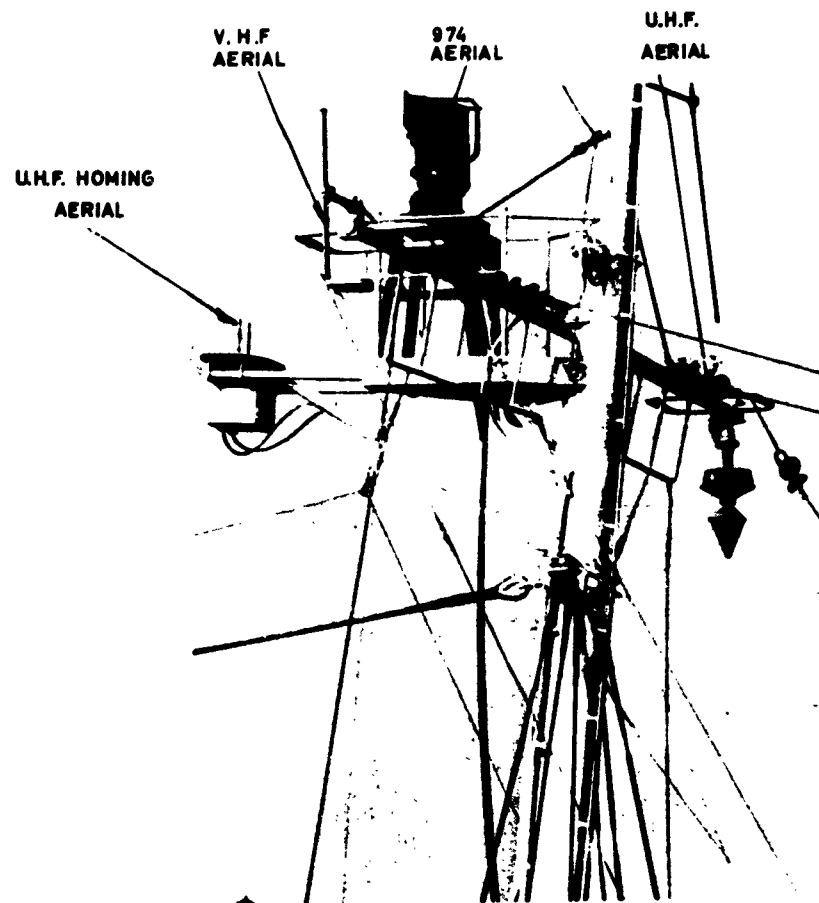


FIG. 24 AERIAL INSTALLATIONS

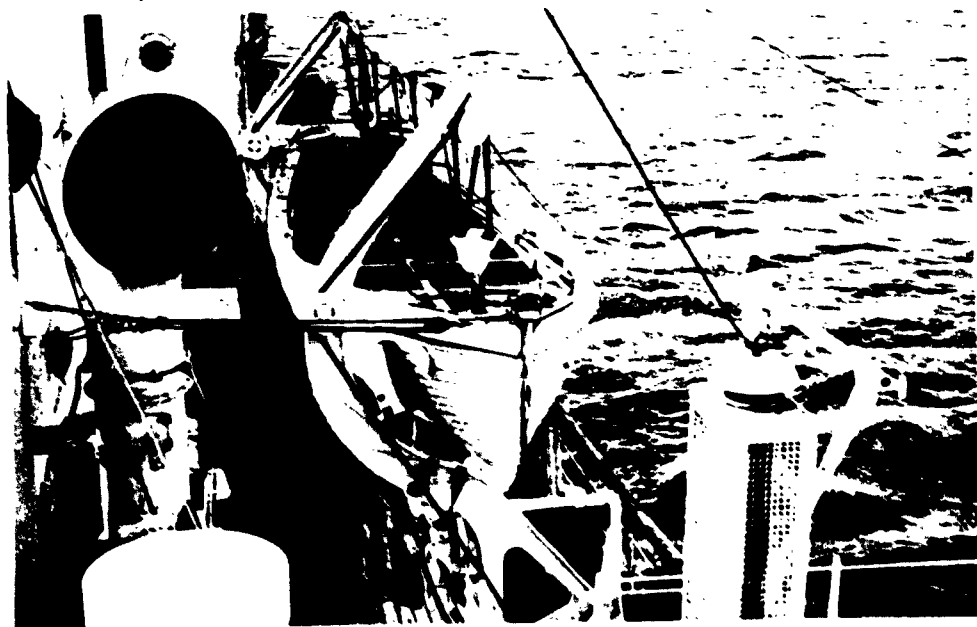


FIG. 25 CABLE CUTTER

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LIFE  
RAFTS



FIG. 26 MOTOR BOATS AND LIFE RAFTS

LIFE  
RAFTS

NEW  
CABINS

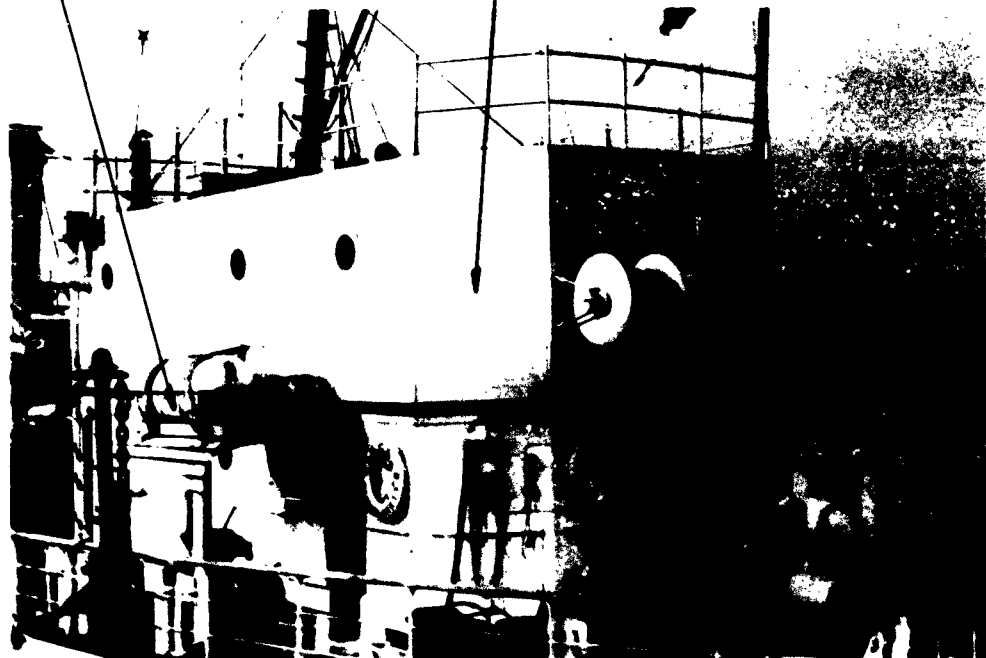


FIG. 27 NEW ACCOMMODATION

RESTRICTED

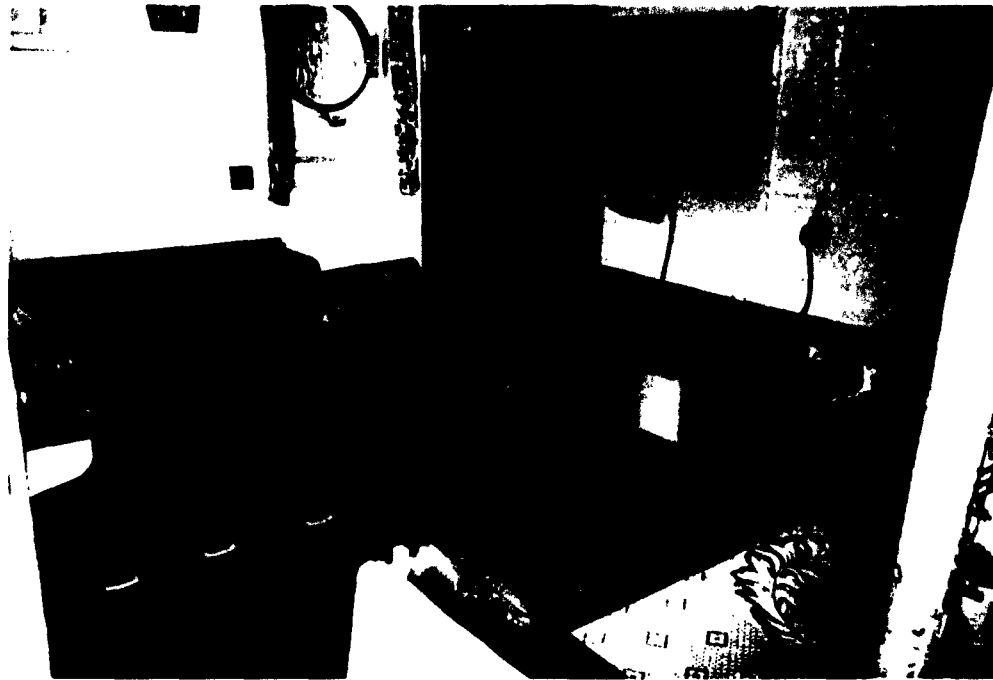


FIG. 28 SINGLE CABIN



FIG. 29 DOUBLE CABIN

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FIG. 30 WARD ROOM



FIG. 31 SHIPS WORKSHOP

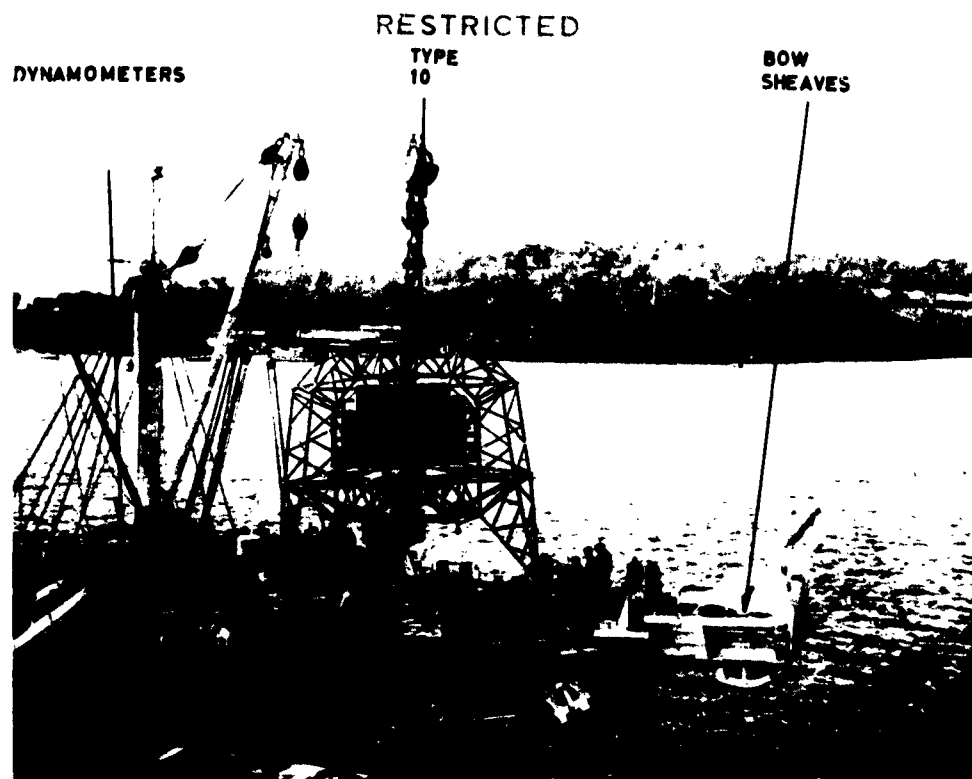


FIG. 32 TYPE 10 LOADED



FIG. 33 TYPE 10 LIFTED OUT



RESTRICTED

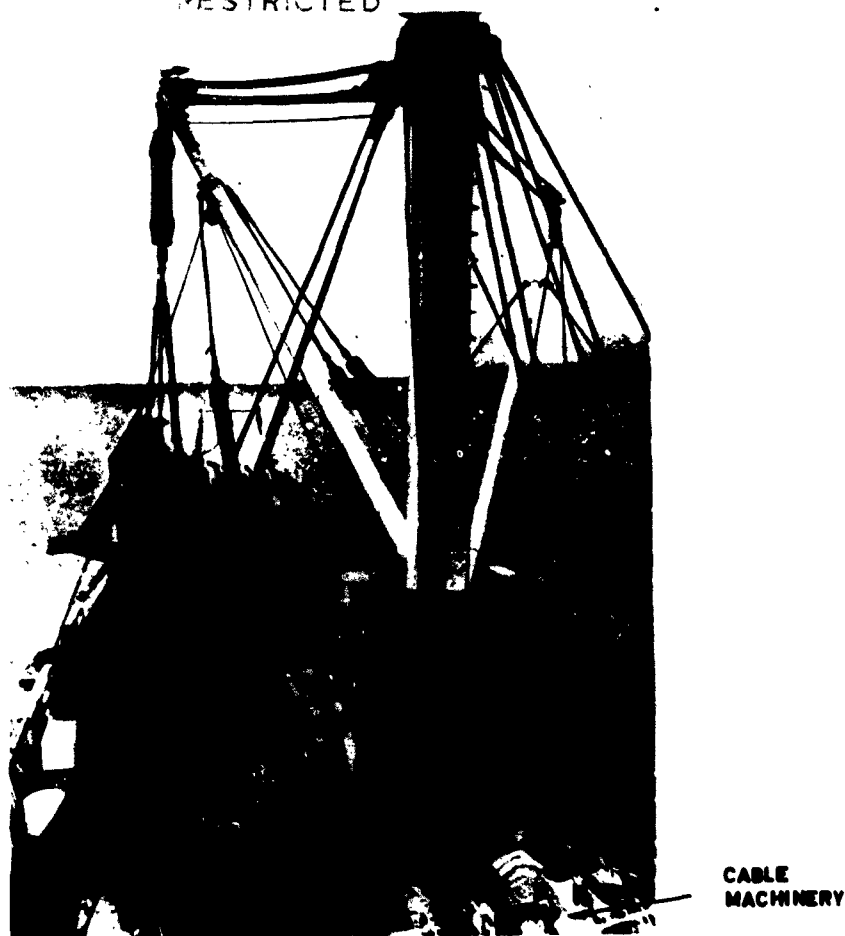


FIG. 34 TYPE 21 LOADED

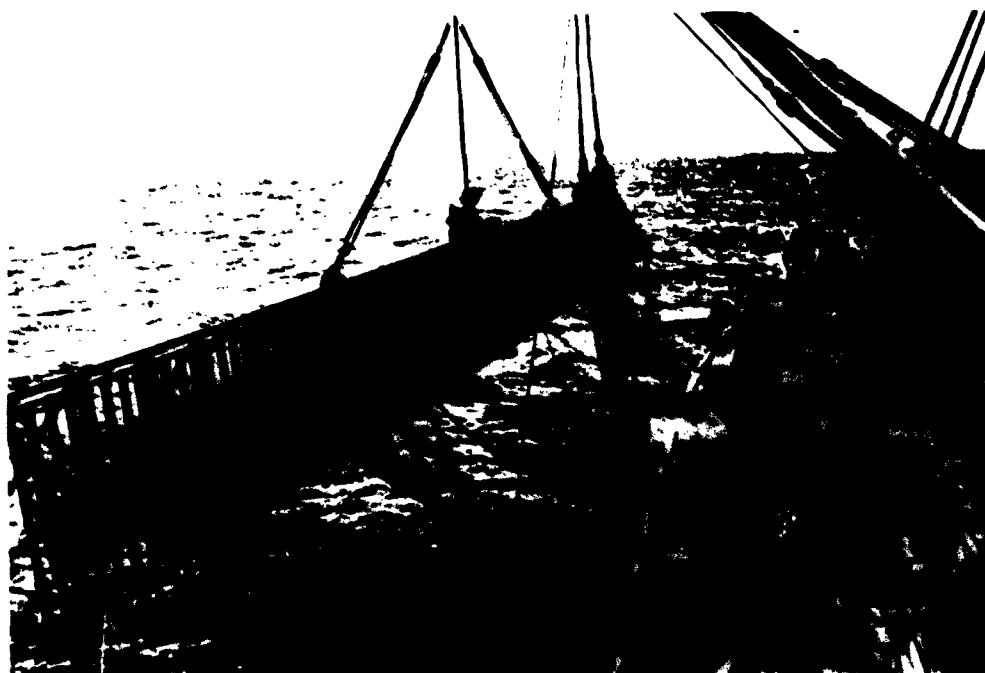


FIG. 35 TYPE 21 LIFTED OUT

RESTRICTED

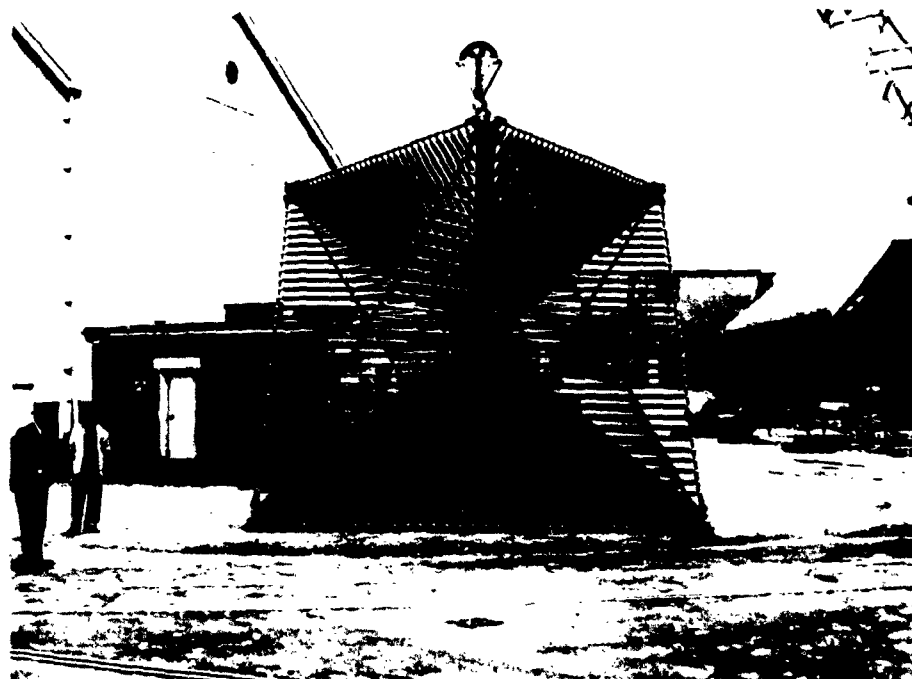


FIG. 36 TARGET



FIG. 37 SOME OTHER TRIPODS

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FIG. 38 TRANSDUCER TEST RIG

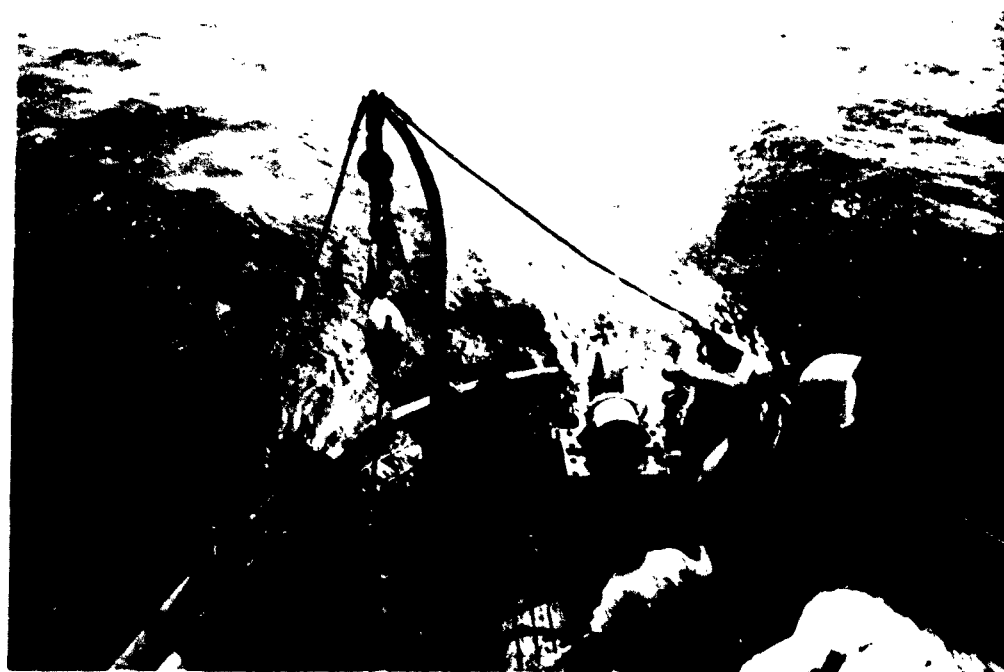


FIG. 39 STERN TOWED TRANSDUCER

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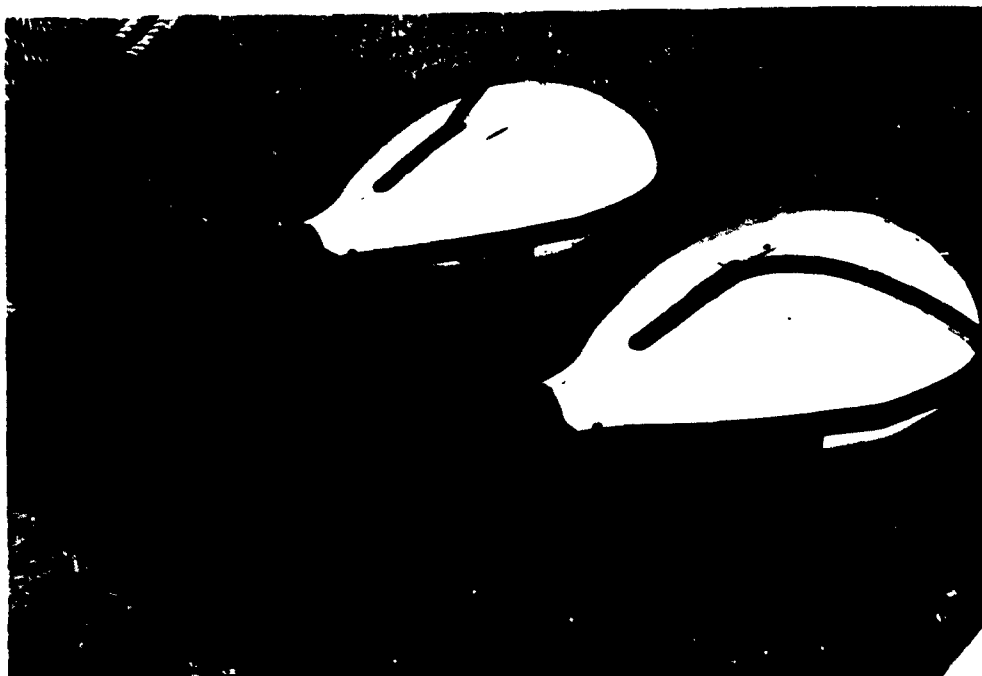


FIG. 40 TOWED BODIES READY FOR STREAMING



FIG. 41 TOWED BODY STREAMED FROM STARBOARD DAVIT

RESTRICTED

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